NATURAL RESOURCES CONSERVATION SERVICE
MINNESOTA FIELD OFFICE TECHNICAL GUIDE (FOTG)
SECTION II WATER QUALITY AND QUANTITY INTERPRETATIONS

PART A

SOIL/PESTICIDE INTERACTION SCREENING PROCEDURE (SPISP) INSTRUCTIONS AND SELECTED PESTICIDE PROPERTIES DATABASE

I. INTRODUCTION

This part, A, of Section II of the FOTG contains a selected pesticide properties database and a procedure which can be used to help determine the potential for specific pesticides to move towards water resources. The database contains information on a number of selected pesticide properties that affect pesticide movement with water. The database also contains a rating for the relative potential of pesticides to move with runoff or leach downward. The ratings are based on the selected pesticide properties.

The procedure combines a pesticide's runoff or leaching rating with a soil rating developed for individual soil mapping units. The individual soil ratings are found in the FOTG. Combining the pesticide rating and the soil rating simulates the interaction of pesticide properties and soil properties and results in a relative rating for a soil/pesticide combination. Soil/pesticide interaction ratings are developed for both pesticide movement below the root zone and pesticide movement in runoff to a field's edge

The soil/pesticide interaction ratings are first approximations of pesticide movement potential and should not by themselves be used to make pest management recommendations. They can however help in the decision making process.

II. PESTICIDE PROPERTIES DATABASE

Selected pesticide properties affecting pesticide fate and associated pesticide leaching and runoff ratings are contained in the database. The data is grouped by herbicide, insecticide, fungicide, and other, and sorted by trade name within the groupings. Appendix A contains a common name/trade name cross-reference sorted by common name. **Properties and ratings for pesticides which contain combinations of active ingredients (e.g. Basis Gold) are listed for the individual active ingredients and not for the combination.**

The pesticide properties database may list chemicals not currently registered for use in Minnesota and will not be considered as a listing of approved products. The Minnesota Department of Agriculture should be consulted concerning the current status of a particular product.

Database Definitions

Trade name/Common name: Trade **names** are the manufacturer's name for products. **Common names** refer to active ingredient compounds. Most pesticides in the "Trade or Common Name" column are listed by trade rather than common name.

Active Ingredient Name: The active ingredient is that part of the product which provides control of the pest. In general, much of a product is inert non-active material.

Signal Word: Danger means the product is highly hazardous; **Warning** means moderately hazardous; **Caution** means slightly hazardous to nonhazardous; and **Varies** means the hazard will vary with the specific formulation of a particular product. A pesticide product is assigned a signal word based on its highest hazard potential. The hazard could be associated with skin or eye corrosiveness or with acute oral, dermal or inhalation toxicity. **X** means the signal word applies to the mixture and is shown in the first

listed active ingredient (e.g. Rimsulfuron for Basis Gold).

Water solubility: The solubility of the pure active ingredient of the pesticide in water at room temperature is given in **mg/l** or **PPM**. Solubility is a fundamental physical property of a chemical and affects the ease of washoff and leaching through soil. **In general, the higher the solubility value the greater the likelihood for movement.**

Soil half-life: Half-life, given in days, is the time required for pesticides in the soil to degrade to one-half of their previous concentration. Each successive elapsed half-life will decrease the pesticide concentration by half. For example a period of two half-lives will reduce a pesticide concentration to one-fourth of the initial amount. Half-life can vary by a factor of three or more from reported values depending on soil moisture, temperature, oxygen status, soil microbial population and other factors. Additionally, resistance to degradation can change as the initial concentration of a chemical decreases. It may take longer to decrease the last one-fourth of a chemical to one-eighth than it took to decrease the initial concentration to one-half. **In general, the longer the half-life the greater the potential for pesticide movement.**

Soil Sorption Index (Koc): Koc or the soil organic carbon sorption coefficient measures the tendency of the pesticide to attach to soil particle surfaces. **The higher the Koc value the stronger the tendency to attach to and move with soil.**

pH: The pH value at which either solubility or Koc values were determined.

G/E: An "E" denotes the solubility rating and/or the half-life rating and/or the Koc rating was an estimate. A "G" denotes the half-life or the Koc rating was a guess. A solubility estimate may be accurate within a factor of two. A half-life estimate or guess could be in error by a factor of two or more. A Koc estimate could be in error by 3X-10X and a Koc guess could be in error by 10X or more.

Leaching Movement Potential: The leaching potential indicates the tendency of a pesticide to move in solution with water and leach below the root zone. The ratings are listed as large, medium, and small with the large rating having the highest potential for leaching.

Combined Surface Loss Movement Potential: The runoff potential indicates the combined tendency of the pesticide to move with sediment and in solution in surface runoff. The ratings are listed as large, medium or small, with the large rating showing highest combined potential to move.

Solution Surface Loss Potential: These ratings show the relative potential for chemicals to move in surface runoff in the solution phase. The ratings should only be used to help select conservation practices which control chemical movement**. Do not use the ratings in the soil/pesticide interaction screening procedure.**

Adsorbed to Surface Loss Potential: These ratings show the relative potential for chemicals to move in surface runoff attached to soil particles. The ratings should only be used to help select conservation practices which control chemical movement. **Do not use the ratings in the soil/pesticide interaction screening procedure.**

III. SOIL-PESTICIDE INTERACTION SCREENING PROCEDURE AND INTERPRETATION

Pesticides have varying potentials to move off-site. Similarly soils vary in potential to move chemicals off-site. Thus, a pesticide applied to two different soils may have different potentials for movement. The Soil Pesticide Interaction Screening Procedure considers the affects of both soil and pesticide properties on pesticide movement.

The ratings for pesticide movement, as noted, are contained in the database. Ratings for individual soil map units to move pesticides by leaching and surface runoff (combined as carried in solution and by soil particles) are found elsewhere in the FOTG. The ratings are listed as slight, moderate, or severe. The current surface runoff ratings do not differentiate between pesticide movement in solution or as attached to soil particles.

Procedure

The user should determine the water resource concern (i.e. ground water or surface water quality), then select the leaching and/or runoff

procedure to evaluate potential loss of a pesticide on a particular soil map unit.

A. Find the leaching rating and/or soil surface loss rating for the critical **soil map unit** from the county specific Soil Ratings in the Field Office Technical Guide.

B. Find the **pesticide** leaching rating and/or the combined surface loss rating in the database. If the pesticide will be applied post-emergence onto a canopy of growing crop and weeds that provides 90% or greater ground cover, reduce the potential for leaching or combined surface loss by one class.

C. Using the matrices below find the intersection of the soil leaching and the pesticide leaching ratings. And/or find the intersection of the soil surface loss rating and the pesticide combined surface loss rating. These intersections result in potentials of 1, 2, or 3. For example, a pesticide with a small leaching rating applied to a soil with a moderate soil leaching rating has a low Potential 3 to leach.

Pesticide/Soil Leaching Loss Potential			
Soil Leaching Rating	*Pesticide Leaching Rating*		
	Large	*Medium*	*Small*
Severe	Potential 1	Potential 1	Potential 2
Moderate	Potential 1	Potential 2	Potential 3
Slight	Potential 2	Potential 3	Potential 3

Pesticide/Soil Loss to Surface Runoff Potential			
Soil Surface Loss Rating	*Pesticide Combined Surface Loss Rating*		
	Large	*Medium*	*Small*
Severe	Potential 1	Potential 1	Potential 2
Moderate	Potential 1	Potential 2	Potential 3
Slight	Potential 2	Potential 3	Potential 3

Interpretation of Potentials

Soil/pesticide interaction potentials should be interpreted according to the following guidelines.

Potential 1: This pesticide applied on this soil can have a high, medium or low probability of moving offsite depending on site and management conditions. The health hazards of these pesticides to humans or animals should be considered. If the potential danger to health or non-target organisms exists, alternative pesticides or alternative pest management techniques such as cultural or biological controls should be considered.

Potential 2: This pesticide applied on this soil can have a, medium or small probability of moving offsite depending on site and management. Additional on-site evaluation is necessary to determine the sensitivity of the water resource of

concern. When a potential water resource problem exists the land user should consider:

1) alternative pesticides; 2) use of band application; 3) reduced rates if possible; 4) cultural and biological control methods; or 5) use of conservation practices to reduce soil loss or runoff.

Potential 3: This pesticide applied on this soil has a low probability of moving offsite.

Limitations

The soil/pesticide interaction ratings are considered a first approximation because of several limitations including those listed below:

A. The ratings do not consider the affects of a specific chemical on human health or non-target species from either a short term high dosage exposure or a long term low dosage exposure.

B. The ratings do not consider site specific factors that affect the half-life of chemicals (e.g. soil texture, pH, organic matter content, moisture and temperature).

C. The ratings are based on the potential for a chemical to move below the root zone or to a field's edge. Transport and other environmental fate factors beyond those zones are not considered.

D. The ratings do not consider numerous management factors that affect the fate of chemicals in the environment (e.g. application rates and application timing).

E. The ratings do not address most breakdown products or metabolites of an individual chemical.

IV. USE OF SOLUTION SURFACE RUNOFF OR ADSORBED SURFACE RUNOFF LOSS POTENTIAL RATINGS

The ability of an individual pesticide to move in surface runoff may vary. For example, SENCOR has a small rating for potential movement in runoff as adsorbed to soil but a large rating for potential movement in runoff in solution. The individual chemical solution or adsorbed ratings should not be used in the matrices described above. However the ratings can be used to help select conservation practices which reduce pesticide movement. In the case of SENCOR, conservation practices that reduce runoff should be considered. Conservation practices which reduce erosion but which may not reduce runoff (e.g. tile outlet terrace) should be carefully scrutinized.